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ABSTRACT

As one component of a university-wide program to improve instructional effectiveness by introducing interactive computing into the curriculum, the College of Education at the University of Iowa received eight computer terminals. The goals of the project were to develop faculty capacity to integrate instructional media into their teaching and to maximize the educational impact of this technology on teacher education students. After initial problems were overcome, the faculty designed numerous computer programs for drill and practice, tutorial, simulation, and computer assisted instruction applications. On-going in-service training was conducted to keep the faculty aware of the latest trends in computer technology, and plans were laid to extend computer use in the future. (EMH)

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Introducing the Computer to Teacher Education:

An Integration of Human and Hardware Technology

by
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Systems.

IR003 087

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An Integration of Human and Hardware Technology".
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Introduction

Late in 1972, a white paper, "Computing in Undergraduate Education at The University of Iowa" was written by Dr. Gerald Weeg, Director of the Computer Center, which was to have a major curricular impact throughout the University. Through the leadership of Dr. Weeg and Dr. D. C. Spriestersbach, Vice President for Development and Research, a plan was developed to introduce interactive computing to the undergraduate curricula throughout the campus. (At that time, it was estimated that 15% of computer usage in the University was committed to instructional application.)

The overall plan recognized the need for systematic consideration of faculty development as well as the acquisition of hardware. Attention was given to the need for faculty familiarization with the potential of interactive computing and for the time necessary for the faculty to develop software essential for the expanded technology. The need for support staff was similarly acknowledged.

An integrated system of mini-computers was proposed to help meet the hardware requirement. Terminals were to be distributed to remote sites via telephone lines. A prototype system was proposed for installation of the hardware, concerted efforts were to be directed to staff development, faculty development, site planning and terminal selection.

A planning committee in each of the participating colleges was established to work with the Computer Center and the Office of the Vice President for Educational Development and Research. Each committee was charged with the responsibility for site planning, training and presenting regular reports on the affect of the system on Learning and the educational process.

Organization for Planning

The College of Education was formally notified in March, 1973, that eight of thirty-two terminals of a Hewlett-Packard 2000F system would be located in the College of Education to support experimental development and instruction. The College Planning Committee was charged to work with a special Computer Center development team on plans for site location and faculty development.

Representatives named to the College of Education Computer Based Education Committee included:

- An Assistant Dean (Chairman),
- Director of the C.A.I. lab,
- A senior professor with a strong computer background,
- A senior professor with a strong background in learning theory and instructional design,
- A junior professor from secondary education with prior experience in computer assisted instruction,
- A junior professor from educational media and instructional development,
- A junior professor from elementary education,
- A graduate student in educational psychology, and
- An undergraduate student in elementary education.

The College committee was strategically selected to include knowledgeable staff with experience in the use of the computer, instructional design and development, and positive approaches to faculty development. Representation from the two largest undergraduate programs, Elementary and Secondary Education, was also a primary concern. The Dean's office was directly represented so as to give visible support and commitment to the program.

Two members of the College committee had also served on the University-wide Computer committee and therefore provided a valuable liaison with campus-wide systems development. The support and involvement of the university administration, the collegiate dean, the College of Education faculty, and students were integrated into a complimentary effort. through administrative responsibilities and committee organization, the efforts of the various collegiate planning committees were integrated through liaison with the Computer Center development team.

Initial Problems and Concerns

Initial problems encountered related to facilities, hardware, software, personnel and organizational interdependencies.

(1) Facilities were not immediately available for placement of eight terminals in a common setting -- though the committee was convinced that dispersal of terminals would lead to factionalization and dilution of student access.

(2) Though the selection of terminals was "simplified" by a prior decision to commit four "Bee Hive CRT's and four teletype terminals to the College, decisions regarding designation for development, students use, and/or possible dispersion still had to be made.

(3) Unlike some fields, education did not have a large collection of developed software immediately available for undergraduate instruction.

(4) Many of the faculty had had little contact with computer technology. Some who had experience with computers in research were skeptical of the value of the computer as an instructional medium.

(5) Even before collegiate plans and priorities could be established, the planning committee was invited to "pool" its terminals with the laboratory of another collegiate unit. Also, departments excluded from the initial pilot project petitioned for access to those terminals assigned to education.

(6) Above all, the College lacked any clear statement of purpose or program objectives relative to computer based education to provide coordinated direction for interested faculty and staff.

Collegiate Purpose and Objectives

To provide direction for development within the College and demonstrate a visible commitment to implementation, a general statement of purpose and enabling objectives were developed.

The general purpose of the College plan was to make a significant impact on instructional effectiveness through computer based technology. If improved effectiveness was to be forthcoming, and products were to be accepted, it would be imperative for the College plan to include a commitment to deliberate examination of each step of the instructional design process and computer technology as an instructional resource. If significant progress in instructional development was to be realized, it was especially important that committed faculty be supported with essential resources to design strategies, develop software, and evaluate results. Thus the following objectives were designated for the aggregate plan.

> Stimulate Faculty Development: Identify a core of committed faculty to develop specific computer based education programs and provide sufficient released time for program planning, development, and evaluation. Those selected would become the nucleus for continuing program development.
>
> Maximize Student Impact: Select and develop computer based education projects which could have an immediate impact on a significant number of students in the undergraduate teacher education program.

Integration of Instructional Media: Explore and develop the potential of computer based technology as a complement to existing media and methodologies. Concurrently, the plan called for establishment of a support lab to provide continuing hardware, software, and technical support to faculty and students.

Promote the Acceptance of Computer Based Education: Through project design, field testing, and evaluation, provide a support base for computer based education programs as effective learning strategies.

Development of Generalizable Products: Through all of the above, the College committee was committed to develop programs and products which could be transferred and implemented at sister institutions throughout the country.

Continuing Faculty Development: As part of the total plan, it was intended that the total project would provide an incentive and example for continuing faculty development and utilization of computer based education programs and materials.

These objectives were intended to integrate the commitment to hardware accessibility, faculty support and development, and broad student access.

Implementation Plans and Strategies

In order to implement the College objectives, it was necessary to turn attention to facilities, hardware, personnel, and software.

FACILITIES - With the completion of the Lindquist Center for Measurement in the summer, 1973, the University Computer Center moved into the LCM and in turn vacated a suite of offices and a large laboratory area. The College of Education was able to acquire use of that space from the University to support the development of an integrated Learning Resource Center Concept.

An organizational commitment was made to incorporate media, computing, library, and curriculum resources into the College Learning Resource Center. Each separate component is directed by a professional level staff coordinator who in turn reports to the Associate Dean of the College. The space vacated by the Computer Center was remodeled to accommodate a Media production laboratory and an adjoining Computer Based Education Laboratory.

One of the goals of the remodeling was to convey to the students the College's concern for learning by providing the students with a pleasant physical environment. Decorators were engaged to select colors and furniture

which would prove attractive and complimentary. The lab area was carpeted in red and purple tweed. One long wall was painted purple with other walls a sedate buff. Acoustical ceiling and wall tiles were also buff. Complimentary dark furniture with walnut and light buff trim was selected. Chairs were dark with red upholstery. The consultant's office was partitioned off at the end of the room for privacy without loss of accessibility.

The response of students who see the room for the first time is usually one of surprise. Some students even inquire about who was instrumental in creating such a poeasant environment. Facilities have proven to be both attractive and functional.

HARDWARE - The central processor was housed at the University Computer Center so no space was required for it. Upon recommendation from the University Computer Center, it was decided to cluster most of the terminals in one area for student use. Two of the eight terminals were not placed in the student lab, but were isolated. These terminals were intended to provide for uninterrupted use by faculty members. The two development terminals were together in the same room but were in a building several blocks away from the student lab where a large cluster of undergraduate faculty were housed. There was no supervision or consultant in the development area. Both development terminals were dial-up. One was a 30 character/second CRT Beehive, the other a 10/character/second teletype with paper tape punch/reader.

In the student lab, all terminals were hardwired to make sign-on somewhat easier. The hardware included three CRTs, two TTYs with paper tape punch/reader, and one TTY with no paper tape capability.

During the first year of the project, data showed that the faculty development terminals were receiving little use. It was decided to bring the CRT into the student lab and trade the TTY for a variable speed portable Texas Instrument Silent 700 which could be taken into public schools for demonstration and to other campuses for extension courses. The portable terminal has also received substantial use in faculty development.

Within six months, it became apparent that developers would be able to accomplish more if they were not interrupted by laboratory activity. An office isolated from the student lab, but nearby, was designated as a development office and a CRT terminal was moved to provide a quiet place for both student and faculty development.

The student lab presently has three CRTs, three TTYs, and dial-up capability for the TI when available. The portable terminal has been in high demand over the past semester. Originally, it was

intended for lab use when not checked-out, but that situation has seldom occurred. When it becomes possible to purchase additional equipment, another portable terminal will be considered.

The TTYs are now over two and one-half years old. They receive one-third to one-half the use of the CRTs. Only people who must have hard-copy are willing to use the slower TTYs. Because the TTYs have depreciated over half their expected five year life, maintenance is becoming a problem. Also because of their slow speed and high noise level, consideration is being given to replacing the TTYs with DEC writers or some similar device one at a time over the next three years. Some hardcopy devices are necessary for developers who need listings and for users who want print-out. There is presently no plan to replace the Beehive CRTs which have provided good service while receiving more use than the TTYs.

Service, maintenance, and consultation regarding all University computer hardware is provided through the University Computer Center. Service, parts, and maintenance costs are $500 per terminal per year. This charge is passed on to collegiate users on a contract basis. Most service related problems are resolved within two working days. The only service and maintenance difficulty has been ordering parts for TTY ASR Model 38. These models are no longer produced so replacement parts must be special ordered and in some cases must be constructed by service personnel.

Early in the operation of the lab, there was some difficulty with the CPU failure. Detective work by Hewlett-Packard engineers and Computer Center personnel located the source. When the custodian vacuumed around the CPU, static electricity transmitted through the carpet would cause the CPU to go into half mode. Modifications in the grounding of the CPU eliminated any further hardware problems.

PERSONNEL - An early commitment was made by the College administration and the faculty planning committee to basic staff support for faculty developers and student users. Resources were thus committed to basic support positions. The goal of the computer lab staff was to provide basic development support and general continuity to lab users and developers.

The initial personnel consisted of a half-time graduate assistant who had five years batch programming experience. General direction came from the Associate Dean of the College. Later, another half-time graduate assistant programmer was added. The two students split the responsibilities into promotion-administration and programming. The students shared responsibility for assisting lab users.

A year and a half into the project, the status of both graduate assistants was changed from half-time to three-fourths-time. Another half-time graduate student was added temporarily for development of a specific project. A work study programming assistant was added for a summer project. Concurrent support was provided for graduate student input as content specialists in selected projects.

After three years the staff was expanded to incorporate a full-time coordinator, a half-time graduate assistant programmer, a work study programming assistant, a secretary shared with the adjacent Media Lab, and a work study typist also shared with the Media Lab. The coordinator reports to the Associate Dean of the College and serves as an ex-officio member of the College Computer Advisory Committee.

There is no full-time faculty member responsible for the operation or activities in the Computer Laboratory but a number of faculty members periodically provide input to the Dean and coordinator.

Faculty development has been encouraged through University Computer Center and Council on Teaching grants to partially cover salaries of faculty and support personnel for C.A.I. development. The College of Education assisted by providing the lab personnel for general assistance to developers. C.A.I. language courses provide a source of student developers.

Throughout this entire project, the advice of C.A.I. consultation at the University Computer Center has been invaluable. The Computer Center has also provided BASIC and IDF language workshops as well as other workshops related to computer usage.

As part of the Learning Resource Center which also includes Curriculum and Media Laboratories, and the Education-Psychology Library, the Computer Laboratory is able to draw on the expertise and technology of these resources for multimedia module development.

A continuing commitment of the College and University administration to visibility and support for new development in Computer Based Education.

SOFTWARE - Merely combining facilities, hardware, and personnel is not sufficient to produce C.A.I. materials. "C.A.I. is addictive; but it needs a pusher to get people hooked."* With this caveat, the College of Education sponsored numerous promotional activities to broaden faculty awareness of instructional computing and to encourage development. (See Evaluation-Process.) In many cases, programs and activities were led by faculty members who had already achieved some degree of success and exposure in development and implementation. Brief descriptions of the software produced by students and faculty follow:

DRILL AND PRACTICE

Math - Basic math review and remediation in areas such as fractional operations, functions, etc.

Media - Review questions for midterm and final exams. Accompanying illustrations are necessary for reference.

Spanish - A brief program reviewing grammar of the present tense in Spanish.

*Dr. Jerry Weeg, Director of the University of Iowa Computer Center.

TUTORIAL

Systems Approach - An introduction to the systems approach as it pertains to education. Highlights differentiating educational goals from objectives, type I, II objectives, components of an education system.

Learning Theory - A lesson designed to teach political science students about the implications and applications of learning theory to socialization.

Interaction Analysis - Teaches students the category system of Flander's analysis; then applies the knowledge using audio tape conversations of students and teachers which the student learns to evaluate.

The program encompasses the 4 formulas of Flander's and their application.

Behavioral Objectives - A tutorial introduction to writing behavioral objectives. Includes a pre-test and post-test. Based primarily on Burns, Mager, and Becker.

Photosynthesis - A tutorial on the photosynthetic reaction. No chemistry is prerequisite. The students will learn chemistry necessary to describe the photosynthetic process.

Math Education - This program teaches prospective elementary school teachers the basic vocabulary, nomenclature, and theory of sets, relations, and the four arithmetic operations.

Math - A series of programs on complex numbers. Introduces and presents addition and multiplication of complex numbers.

Computer Programming - An IDF program to teach IDF to users who have had no computer experience. This module is quite inclusive and presents a more detailed view of IDF to beginners than the H-P manuals.(2000F version)

Photography - A tutorial which leads beginning students through meaning and use of depth of field.

Educational Administration - A tutorial program which teaches the basic concepts, conditions, formulas, and types of queues.

Another program gives actual queuing problems to solve.

Statistics - A teaching module which stresses key point in statistics and allows students to build sampling distributions using simulated data.

SIMULATION

Photography - This program teaches students how to process Ektachrome film using a simulated darkroom.

Photography - This program instructs beginning photography students in the process of making black and white prints. It introduces to darkroom hardware, then carries them completely through the print-making process.

Statistics - Computation modules in Bayesian Statistics where students input data and are able to observe the results.

Computers in Education - two introductory programs dealing with different aspects of interactive computing in instruction. TEACH1 introduces the first time user to several modes of C.A.I.: drill and practice, simulation, short answer. Illustrates the kinds of things an interactive computer can do.

TEACH2 is a program for inservice teachers recommending ways they could incorporate computing into their teaching and school system.

Classroom Test Development - This is a program which teaches how to compose effective classroom tests. The user is allowed to select ten tiems from a pool of 100 items. He is then given relevant statistics on his test.

Elementary Science - FORCE A, FORCE B, FORCE C, FORCE D - A 4-lesson simulation on force and motion. Each lesson is accompanied by a film which should be viewed before the student goes to the terminal. It is used here to acquaint science education students with an alternative to laboratory experiences.

Delphi Inquiry Method - An instructional program on the Delphi technique with simulation and tutorial modes. The simulation mode has exercises in research methodology based on the instruction.

Sociological Game - A computer simulation of the board game, GHETTO, where students are presented situations encountered by ghetto-dwellers and the students try to improve the ghetto conditions through their decisions.

The student chooses what activity he/she would like to engage in to gain points. Among the choices are work, school, hustling. Can be played in groups or individually.

Law - Two simulations which teach problems solving in civil procedure. These are to be used in first year civil procedure classes at University of Iowa law school.

TORT (injury) case where the student assumes the role of defense attorney and carries the case through litigation. The plaintiff and court respond to defense as would happen in reality.

CONTRACT is similar but based on a different case.

Teacher Education - A set of classroom management simulations for student teacher of elementary grades. Places the student teacher in the role of decision maker and presents a situation which could occur in a classroom. The student teacher makes decisions and learns their results.

Teacher Education - Series of management simulations which confront secondary science student teachers with classroom situations about which they must make decisions. Contingent on each decision is the next decision, etc., presenting probable results at each step.

Counseling - Simulation for counseling education students where the student is faced with a client and the student must make decisions about the problems. Contingent on the decision, the student is branched to the next situation for another decision.

Teacher Education - Questioning Techniques -- A simulation where the student has a set amount of "time" to fulfill a teaching objective. The student is to inductively determine which questions he/she should ask to best direct the learners toward the objective. Remediation is also provided.

Teacher Education - Elementary Math -- Elementary math simulation -- a course to assist teachers in diagnosing and tailoring elementary math to meet the special needs of the students.

COMPUTER-MANAGED INSTRUCTION

Instructional Design - 12 CMI modules which test over readings in instructional design. Directed toward upper level or graduate students in education.

A review module is available which selects five questions from each of the 12 units prior to taking the final.

Computers in Education - Eight CMI modules which survey computer application in education.

Teaching of Reading - A CMI diagnosis and prescription reading program. The program presents 18 characteristics which trained teachers use to observe reading behavior in children. Based on responses to these 18 traits, lesson plans are generated for specific reading needs.

Counseling - Two testing modules for counseling students. Based on sets of assigned readings.

Media - A test item pool containing more than 2000 items has been developed to generate tests covering a broad range of experience in educational media. This project was implemented on the IBM 360 system; not on the Hewlett-Packard system.

There seems to be a cycle which occurs in computer development. Often some event triggers increased development. This event is followed by an increase in student use as the materials are being field-tested and integrated into instruction. The developer then documents and reports results and the cycle for that developer begins again. Because all developers began at more or less the same time in this University plan, the cycle affects each stage of the developmental process at approximately the same time for different projects. For example, there was a great surge of student use during the spring of 1975 when materials were used for the first time. Fall semester development was minimal but reporting of results has been greater than for any other semester in the total project.

On-going development and promotion of Computer Based Education is included in the plans of the College. At least two events each semester are scheduled to promote awareness of the Computer Lab and its resources to faculty members.

The Computer Advisory Committee and the College administration recognize significant original contributions to software and program development in faculty evaluation decisions.

In the academic year prior to the arrival of the Hewlett-Packard interactive system, (1972-1973) 344 graduate and upper division students used the IBM 360/65 system primarily for research in 11 classes. The first semester that the H-P was available, there were 582 undergraduate and graduate students in nine courses using the H-P system. There has been a continual increase in H-P use by both undergraduate and graduate students.

Student and faculty development has remained fairly constant since the beginning of the H-P project. Currently there are 28 major instructional modules completed and three still in development.

Table I reports the use data since the beginning of the project.

Currently, conditions, costs, and distribution of materials are concerns of developers. The Computer Laboratory, is cooperating with CONDUIT, an established distributor of computer materials. CONDUIT is just beginning to handle education and interactive modules.

It has been the policy of the lab to maintain records of events and/or strategies of promotion and note the result in terms of operation, development, and student use. For example, the isolated development terminals intended for faculty use sat idle much of the time. The faculty seldom directly programmed or entered their materials. Students who assisted faculty often needed programming assistance so when the development terminals

were again isolated - but this time nearer to programming consultants -- use was greater.

From Table II, one can see the relationship of the promotional events, development, and student use.

Probably the single most effective event in stimulating C.A.I. development was the intercollegiate sponsorship of a simulation designers workshop presented in the fall, 1974. Dr. James Bobula of the University of Illinois Medical Education Center spent two and one-half days assisting designers in developing paper and pencil simulations. Some of the paper and pencil simulations were later expanded and implemented on the computer. Some of these modules become the core research for Ph. D. dissertations as well as other research studies.

Other major events include summer grants given by the University Computer Center and University Council in Teaching to professors to develop C.A.I. materials. Courses in C.A.I. languages and more general Computers in Education courses have aroused interest in students which frequently results in development modules. Local newspaper and University press releases have devoted articles to computing and its impact on education and to individual faculty projects being developed at the University.

A day-long faculty retreat held off-campus which focused on the innovative use of instructional technology. The Dean encouraged faculty members to dismiss classes for the day so all faculty and students who wished to would be able to attend.

Continuing interest in computer simulation has led to two additional simulation designers workshops presented locally by participants of earlier workshops who progressed into more sophisticated computer application techniques.

An information exchange with the other Regents institutions led to additional interest in development. A similar exchange with the University of Nebraska at Lincoln should also stimulate development.

There has been a great deal of promotional activity in order to create an awareness of computing and its value as an instructional aid. A number of users and developers are involved and regularly utilize the facilities provided. Attention is now being turned to those users who are interested but who do not have the time or expertise to complete projects who are in areas which have made little use of computing. There is now a core of sophisticated users who assist their faculty colleagues with new development. In this way, the expertise of a few can be viewed as a multiplier throughout the College.

The outcome of computer use was measured on two different dimensions: performance and attitude.

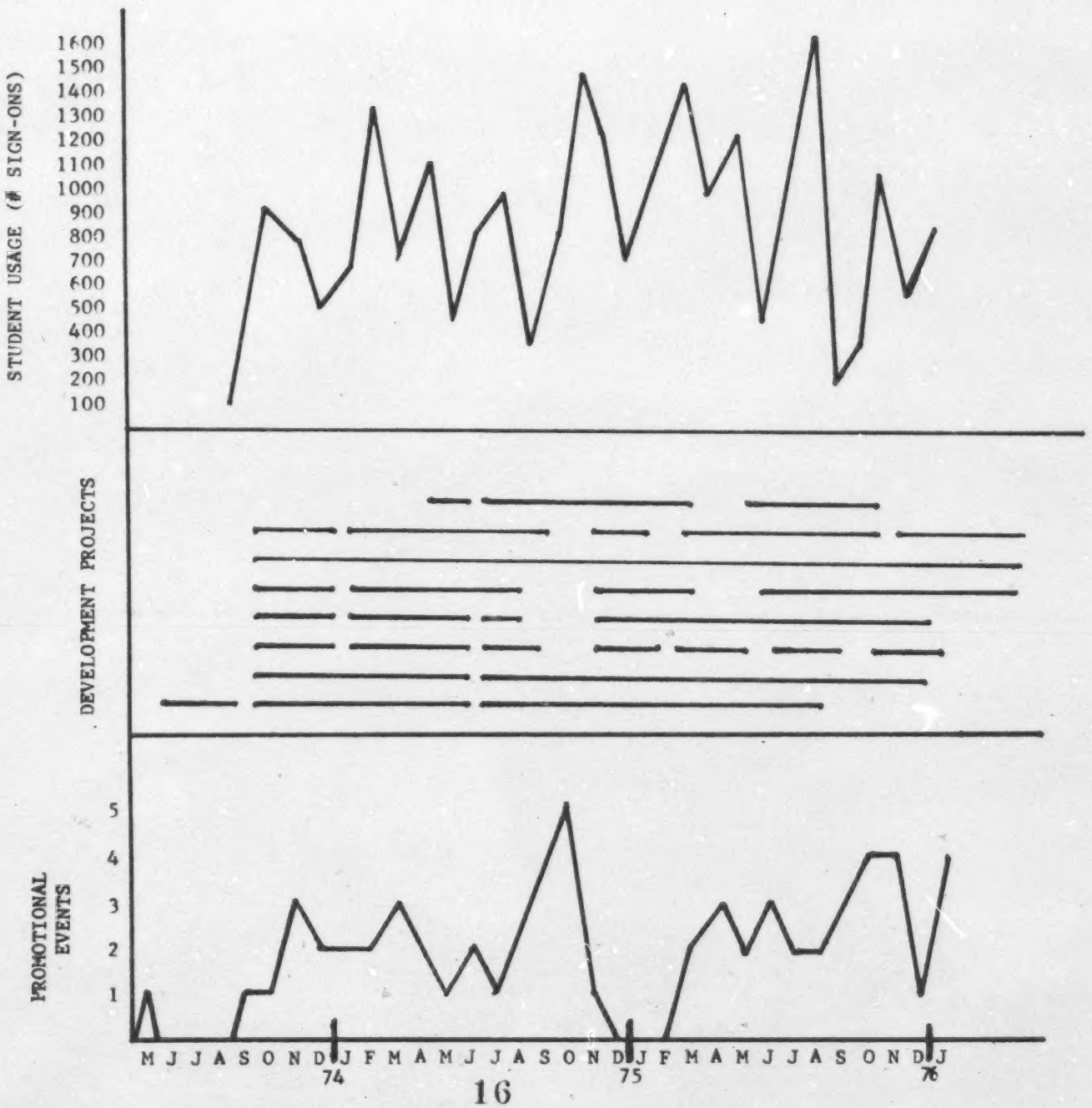
TABLE 1

USE SUMMARY

	1973 Fall	1974 Spring	1974 Summer	1974 Fall	1975 Spring	1975 Summer	1975* Fall	TOTAL
# courses	9	17	10	17	12	13	12	90
# students								
Users	582	681	118	786	558	246	583	3554
Developers	11	4	4	7	8	4	2	44
# faculty								
Users	9	18	10	15	9	12	14	87
Developers	7	2	4	2	4	2	2	22
Terminal Time (minutes)	52617	141079	59680	133241	144401	69705	81792	682515
# sign-ons	1943	3844	1663	3931	5044	2823	2668	21916

* December, 1975, estimated from December, 1974

TABLE II


STUDENT USAGE (# SIGN-ONS)
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
DEVELOPMENT PROJECTS
PROMOTIONAL EVENTS
5
4
3
2
1
M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J
74
75
76

Students were exposed to both instructional programs and computing as an instructional aid. An attitudinal survey regarding several facets of the computer and computer related applications was thus administered to a sampling of all students.

The attitude survey polled 19 undergraduate and graduate students in the summer of 1974; 142 in fall, 1974; and 125 in spring, 1975.

Results of the largest sample (142) indicated that 90 percent of the students had never used a computer before. Ninety percent agree that the computer was a useful tool of instruction. Although 85% said they had no knowledge of programming languages, 70% reported that they would like to take more courses using the computer though not necessarily to program for it. About 50% said if a computer were available, they would use it in their own teaching. However, 50% felt that a computer course should not be required for either a degree or teacher certification.

Evaluation of cognitive gains and learning effectiveness has been a structured objective within all projects. One complete module reports results of a multimedia series which teaches Flanders' Interaction Analysis to undergraduate social studies methods students. This module shows that of a possible 22 post-test responses, the experimental computer group (N=14) had six perfect scores and five scoring 21. The lowest score was 19. In the control group (N=13) matched to the experimental group on ACT and cumulative grade point average, the high score was 20 and the low was 13. Time compression was also significant. The experimental group spent 2.2. hours in instruction, the control group 3.3. It also appears that students with low ACT and GPA generally performed better via C.A.I. than with the traditional method.

Similar results were obtained in a series of four film loop and computer simulations to teach the relationship of force and motion according to Newton's Second Law. Three groups were used. One group viewed the films and used the computer simulation, a second group studied the same material using non-computerized simulations materials and a science lab, and a third received the usual lab and class instruction. The computer group spent a minimum of one hour and forty minutes on the terminals. They did no outside work on the material. The student who had benefit of the lab and simulation material spent six forty-minute periods on the material plus 45 minutes for each student outside class. The regular lab group spent between nine and eleven fifty-minute periods on the material plus twenty to thirty minutes on homework. The ratio of concept learning for the computer group compared to the regular lab group was 8:3 to 1. The group which received access to the simulation materials and film but not via the computer fell between both other groups in achievement and time spent. Retention after a six month period was significant for all groups, but especially for the computer and regular lab group.

Other results have not used control group designs but have used pre-post test comparisons, all of which show learning was accomplished with the C.A.I. modules.

Future Plans

The commitment of the College of Education to a full-time coordinator has already been made. Additional staff support will be considered when necessitated by increased development demands. Possible areas of growth are full-time programmers, instructional design consultants, and clerical support. A faculty member might share an appointment and teach computer related courses for student developers as well as provide input into the lab operation.

Faculty development grants have provided the necessary released time and support for assistants which enables faculty members to design materials which they might not otherwise be able to produce. This method of allocating resources will continue to insure continuous development.

The computer lab staff has developed a workshop to introduce secretaries to IDF. In this way, the entry of C.A.I. modules can be done by the clerical staff who are already available to faculty developers.

On the basis of the fall, 1974, attitude survey, 72% of the students agreed that they would like orientation information in addition to the step-by-step sign-on sheet provided. A later survey determined that of formats preferred by students who would like additional help: 16 percent preferred a demonstration, followed closely by programmed instruction by 15 percent. Recommendations will be made to faculty assigning C.A.I. modules to provide demonstrations for student users or to have the lab staff provide this service. A branching programmed text will be designed to help students with sign-on. The survey will again poll student users to determine their responses after using such materials.

In an effort to incorporate new C.A.I. applications into basic research systems, recommendations will be solicited from C.A.I. research personnel and resources. In this way, developers will be able to utilize the recent research findings in designing projects.

Distribution of C.A.I. applications into basic research systems, recommendations will be solicited from C.A.I. research personnel and resources. In this way, developers will be able to utilize the recent research findings in designing projects.

Distribution of C.A.I. materials through CONDUIT will be implemented soon and acquisition of materials from a variety of sources will continue. Currently a Coursewriter III program is being translated into the Coursewriter Facility by Hewlett-Packard. This will be the first program in the College of Education to undergo the new H-P translation.

A system upgrade from H-P 2000F to H-P 2000 ACCESS is scheduled for semester break. This is the first of several phases in system development which will ultimately enable communication with the IBM 360/65. As a result of this first phase, the H-P terminals will have remote job entry capability into the IBM batch processor.

In order to encourage continued research and development in the area of computer based materials, the University has presented a special request for funds to the Board of Regents. The College of Education was among those collegiate units which pressed strongly for such a commitment. It is indeed encouraging that the University has high priority concerns for the advancement of instructional computer development.

Conclusion

The University of Iowa College of Education Computer Based Education project has had a significant impact on both student users and faculty developers.

This project was the result of a cooperative effort which included the University administration, College administration, College faculty, Computer Center, Computer Lab staff, and students in the College.

This integration of human and hardware technology has made possible instructional development which otherwise might not exist.

One result of this integration has been to provide a new mode of instruction to students in the teacher education programs at The University of Iowa. Perhaps the most exciting result of all has been that learning can be more effectively achieved through C.A.I. than through traditional classroom methods.

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Users	582	681	118	786	558	246	583	3554
Developers	11	4	4	7	8	4	2	44
# faculty								
Users	9	18	10	15	9	12	14	87
Developers	7	2	4	2	4	2	2	22
Terminal Time (minutes)	52617	141079	59680	133241	144401	69705	81792	682515
# sign-ons	1943	3844	1663	3931	5044	2823	2668	21916

* December, 1975, estimated from December, 1974